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Comparative analysis of the acquisition of syllabic structure and errors in preschool children with SLI*

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According to the “Implicit grammatical rule deficit hypothesis” (Crago & Gopnik, 1994) adapted by Fee (1995) to phonology, Consonant Vowel (CV) structure is universal and complex syllable structures are reduced to CV. Syllabic structures and their simplification processes were analysed in a group of children with SLI (N=5) and compared with those found in two control groups, one matched by age (N=5), and the other by MLU-w (N=5). The children with SLI were slower to acquire syllabic structures than the Age Controls, and maintained simplification processes that were not seen in their age-matched counterparts. Language Level Controls and the children with SLI presented differences in the first acquired structure, the CV. However, syllabic simplifications do not appear to be unique to the SLI; even though simplifications persist for longer in these subjects than in Age Controls, their prevalence is similar to that found in the MLU-w controls. Our results do not support Fee’s hypothesis.

Keywords: Specific Language Impairment (SLI), syllables, phonology.

Análisis comparativo de la adquisición de la estructura silábica y sus errores en niños preescolares con Trastorno Específico del Lenguaje (TEL)

De acuerdo con la “Hipótesis del déficit en la regla gramatical implícita” (Crago y Gopnik, 1994) adaptado por Fee (1995) a la fonología, la estructura silábica Consonante Vocal (CV) es la estructura silábica universal y las otras

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estructuras silábicas son reducidas por lo niños a esta. La estructura silábica y sus procesos de simplificación son analizados en un grupo de niños con Trastorno Específico del Lenguaje (TEL) (N=5) y comparado con aquellos encontrados en dos grupos de control, uno emparejado por edad (N=5), y el otro por el nivel de lenguaje medido con la Longitud Media del Enunciado por palabras (LME-P) (N=5). Los niños con TEL fueron más lentos al adquirir las sílabas que sus controles por edad y mantuvieron procesos de simplificación que ya no se observan en sus parejas por edad. Los controles por nivel de lenguaje y los niños con TEL muestran diferencias en la sílaba que primero se adquiere, la CV. Sin embargo, las simplificaciones silábicas no parecen ser exclusivas de los niños con TEL; aunque las simplificaciones persisten durante más tiempo en estos niños que en los controles de edad, su prevalencia es similar a la encontrada en los controles de LME-P. Nuestros resultados, por tanto, no apoyan la hipótesis de Fee.

Palabras clave: Trastorno Específico del Lenguaje (TEL), sílabas, fonología.

Introducción

SLI has been a major focus for psychologist and language researchers in recent decades, because it allows the study of the disassociation between language and cognition. Most research to date has been centered on morpho-syntax. The most recent hypotheses today lay particular emphasis on phonology. The aim of this paper is to study the acquisition of one of the levels of phonology, the syllabic structure, in children with SLI.

According to Leonard (1998) and Stark and Tallal (1981), children with SLI show normal cognitive function (normal scores on nonverbal intelligence tests), normal audition, normal emotional and social evolution, no evidence of brain damage or other neurological deficits, but a clear delay in language development, of at least one and a half years. Language problems affect morphology (e.g. omissions of function words and errors and omissions in inflected morphology), lexicon (e.g. errors in verbs and lexical access), pragmatic skills (poor coherence), syntax (poor syntactic structures) and, of course, phonology (see Leonard, 1998, for a review).

Phonology in SLI

Few descriptive studies of phonology have been carried out in subjects with Specific Language Impairment. Most analyses have focused on morphological and syntactic components. Moreover, in the studies of phonology in SLI that have been performed, the subjects tend to be very young, and so we cannot be sure whether these children will evolve towards normality (and can therefore be considered to present Language Delay). Some studies have divided children into groups. Nettelbladt (1992) carried out a longitudinal study with 10 Swedish children aged between 3 and 6 years old, with different degrees of language disorder, finding differences in the

number and type of simplifications used: the five children with more severe language disorders had structure simplifications (weak syllable omissions, cluster reductions and final consonant omissions), besides assimilations and reduplications, while the other five children mainly presented substitutions of a particular sound.

Roberts, Rescorla, Giroux and Stevens (1998) also divided the subjects into groups, since they had observed a wide variability in the phonetic measures of the SLI children in a previous analysis (Rescorla & Bernstein Ratner, 1996; Roberts *et al.*, 1998). One group comprised children who had reached their age-matched counterparts in terms of the number of productions (Late Talkers), and the other group included children in whom this variable was delayed (SLI). The results showed that Late Talkers presented no differences in the number of unintelligible productions compared with the age controls, although a slight delay still existed in the phonetic inventory and in the percentage of correct consonants; the performance of the Late Talkers was always better than the SLI group, which presented significant differences in all these variables compared with the other groups. The differences between the two groups in terms of the percentage of correct consonants and the phonetic inventory were due to stops and glides (that is, sounds of early acquisition).

One drawback of most of these studies is that they control the data through age controls. This means that they do not focus on the most problematic areas in the children with SLI—only those that present a delay. Some studies have tried to compare SLI children with a control group with the same level of language. One of the first attempts to analyse phonology in Language Disorders compared with MLU controls was by Schwartz, Leonard, Folger, & Wilcox (1980). Their study showed that there were no absolute differences in the syllabic structures and in the phonetic targets used by the two groups. Nor were there absolute differences in the children's productions of these targets at the age of three; the phonological processes that both groups used most frequently were cluster reduction, weak syllable omission, final consonant omission and fronting. However, the authors did observe differences in the frequency of some of these processes in these groups.

Beers (1995) compared the presence of unusual processes¹, such as lateralization, metathesis and initial consonant insertions, in SLI children aged between 4 and 6 years and a group of children with normal acquisition, pairing them by their level of acquisition of the phonological contrasts of their language. The results showed that the proportion of unusual processes was similar in SLI and normal children when the complexity of contrasts was low (4-5 years for SLI and 1;3-2;2 for normal). However, as the contrastive capacity increased, the percentage of unusual processes decreased in normal children, but remained constant in SLI children, in spite of the increase in their contrastive systems. At 5;6 years the SLI children presented more unusual processes than their counterparts.

¹ Unusual processes were defined as processes that are not frequent in normal acquisition.

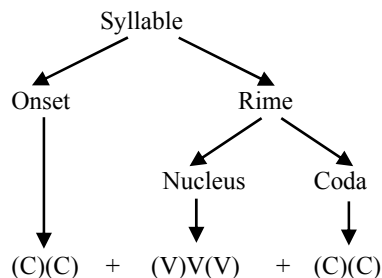
Other studies comparing phonological acquisition in SLI and age controls have showed a delay in this component. SLI children had a low rate of verbalisations, a small inventory of consonants and vowels, and were more unintelligible (Rescorla & Bernstein Ratner, 1996). The simplifications found most frequently in all the languages studied were weak syllable omissions (Beers, 1992; Hansson, Nettelbladt, Leonard, Salameh, & Hellquist, 1998) and processes involving syllable reduction, such as omissions of final consonants and consonant cluster reduction (Fee, 1995; Beers, 1992; Hansson *et al.*, 1998; Orsolini, Sechi, Maronato, Bonvino, & Corcelli, 2001). Every language and every study has found different types of substitutions patterns, but the most frequent are those involving the /d /, /l / and /r / triangle (Beers, 1992). Moreover, these phonological problems have been related with some of the morphological problems (Aguilar-Mediavilla, Sanz-Torrent, & Serra-Raventós, 2007; Cooperson, Bedore, & Pena, 2013) and literacy problems (Vandewelle, Boets, Ghesquière, & Zink, 2012) of children with SLI.

The Missing Features of Grammar hypothesis

One attempt to explain the phonological problems of children with SLI was provided by Fee (1995). Fee predicts the reduction of complex syllables to CV, following Gopnik's theory (Crago & Gopnik, 1994): the Missing Features of Grammar hypothesis explains SLI as an incapacity to acquire language-specific rules. This prediction for phonology is based on the fact that complex syllables are language-specific and have to be learned through language specific rules, whereas CV syllables are universal. The inherent cause of deficit in SLI children is that they lack the grammar features that allow the construction of language-specific rules. This means that they are unable to learn language-specific complex syllables; in contrast, they produce the CV universal structure without difficulty.

In short, no problems were predicted for CV syllable production in our study; in contrast, a high number of syllable reductions in complex syllables were expected.

The Spanish and Catalan Syllabic structure and their acquisition:
Spanish and Catalan syllables have the following theoretical structure:



As can be observed, the minimum syllabic and obligatory element is the nucleus. In these languages the nucleus can only be a vowel. This nucleus can be complex or simple; when complex, it comprises the vowel /i/ or /u/ and any other vowel in ascending or descending order.

(1) *agua* (water) → /'a-ɣwa/ → 'V-CVV

Another peculiarity is that Spanish and Catalan do not differentiate between short and length vowels.

The onset can also be either complex or simple. The simple onset can be formed by all the consonant segment except /p/. The complex onset is formed by a stopped or the fricative /f/ followed by the liquids /p/ or /l/ (except /t/ and /d/, which can only be followed by /p/).

(2) *pluma* (feather) → /'pluma/ → 'CCV-CV

The coda can be simple or complex. Spanish and Catalan have a high frequency of codas that can be formed by any of the modes of articulation. Complex codas are more frequent in Catalan than in Spanish; they can be constructed by three elements, while in Spanish they can have only two elements.

(3) *casc* (helmet) → /'kask/ → 'CVCC
abstraer (to abstract) → /apstra'er/ → VCC-CCV-'VC

Although there are a high number of possible syllables in Spanish and Catalan, the most frequent ones are CV (54.9%), CVC (21.5%), V (4.9%), VC (4.8%), CCV (48%), CVV (4.1%), CVVC (2.7%) and CVV (1.19%) (The percentages are for Spanish but the order in Catalan is similar) (Justicia, 1995).

Stress is free, but only the last three syllables can be stressed (except when the word is a verb with clitic pronouns ex. *explicitámelo* (explain this to me) (Badia, 1994; Alcina & Blecua, 1994). On the other hand, the duration of syllables in Spanish and Catalan is independent of stress (Alcina & Blecua, 1994); weak syllables are the same length as stressed ones.

Acquisition of syllables is similar in Spanish and Catalan. At the age of 2 children have already acquired the CV and V syllables. At this age syllables with multiple structures begin to appear (nucleus and multiple onset) and closed syllables (syllables with coda), although children still present reductions to the structure CV and V. According to Lleó (1997) children acquire codas before complex onsets (clusters).

Miras (1992) observes that 3-year-olds prefer open syllables (CV) but begin to use the closed syllables. At this age, 90% of children have already acquired diphthongs (Bosch, 1983; 1987). Later, children begin to use syllables with mul-

tiple onset components, and finally they acquire syllables with multiple codas. The data show that by the age of 6, 90% of children have already acquired the clusters although the multiple codas have not been acquired by the age of 7 (Bosch, 1983; 1987).

Many models have been proposed to account for the acquisition of syllables, and try to explain why children simplify the syllables. Most of these models have based on the notion of syllabic templates (Fikkert, 1994; Demuth & Fee, 1995) but more recent approaches have focused on the concept of constraints (Handford & Stemberger, 1998). This approach explains syllable acquisition, production and variability through the interaction and ordering of violable constraints that could be cognitive, physiological (Vihman, 1992) or innate (known as the Optimality Theory, Lleó, 1997). The higher order constraints are less likely to be violable than lower order ones. For the acquisition and production of syllabic structure there are some constraints of structure and upward linkage, e.g. *Every onset node must be linked upwards*; others of downward linkage, e.g. *a syllable must dominate a rime*, a set of general constraints that prevent the presence of components e.g.. *Rimes are not allowed*, and lastly there is a set of constraints that deals with complexity within the syllable, e.g. *complex nucleus are not allowed*. This constraints defines the CV as the canonical syllable, or the syllable that violates the fewest constraints.

One of the advantages of this approach is that it can explain the variability between the productions of adults and children, and between the productions of different children. The differences between children are explained by the differences in the ranking of constraints, and the differences between productions in the same child are explained by the status of violability of the constraint, i.e. whether or not violability is permitted.

Research questions

The first objective to complete was to describe the acquisition of syllabic structure in SLI children and in normal subjects. We aimed to determine whether acquisition was similar to that in the normal situation –though delayed– or atypical. We expected to find a delay and an atypical syllabic structure acquisition in SLI children. If this prediction was borne out, we aimed to establish the points of phonological acquisition in the children with SLI that differ from those found in children that are acquiring the language normally. We then intended to check whether our results supported the Missing Features of Grammar hypothesis. We expected no differences in CV syllables, but we expected to find more syllabic simplification processes in children with SLI than in the other groups.

Methodology

Sample

The sample comprised three groups of five children –one study groups, and two controls. In total, 15 children were analysed.

The study groups were part of a larger longitudinal research project carried out by M. Serra at the University of Barcelona. This project screened schools in Catalonia with a speech therapy unit, searching for bilingual children with language acquisition problems at the age of 3. After this screening, the children with language acquisition problems were evaluated through AREL a protocol of analysis of language (Pérez & Serra, 1998) which includes a morphological, lexical, pragmatic and syntactical analysis through a guided interview with the child. The audition of the children was also evaluated with an air and bone audiometry, and intelligence with the Wechsler Pre-school and Primary Scale of Intelligence (WPPSI) (Wechsler, 1996). Their parents were interviewed through an anamnesis concerning the pregnancy, birth, possible neurological problems and later evolution of motor, cognitive, linguistic, and perceptive abilities. The criterion applied was the presence of more than one and a half years of delay in the acquisition of language, an audition of 20 db. in the frequencies 500, 1000 and 2000 Hz., a score higher than 85 in nonverbal IQ and an absence of social or emotional problems and evident neurological damage. Twenty children met this criterion and were included in the study.

The children were followed up every three months. These follow-ups included a structured video-recorded interview with the child's speech therapist. After a year of follow-up, when the children were aged approximately 4;10, they were classified in two groups using AREL (Pérez & Serra, 1998) to assess their evolution on several points: the Mean Length of Utterance measured by words (MLU-w) as a gauge of their general evolution, the use of functional words (articles, prepositions and conjunctions) and the Schwa, omissions of nuclei and functional words, the acquisition of verbs and the evolution of non-understandable utterances². After this grouping, seven of the children were classified as SLI – those that had evolved slightly – and 13 as LD, those that already presented normal values for language acquisition. For this study we chose 5 children with SLI at the age of 3;10 at the first interview.

Each control group also comprised five bilingual Spanish/Catalan children. The first was an age control group who underwent the same structured interviews as the SLI and LD groups. The second was a language level control group, calcu-

² Non-understandable utterances are considered productions for which three evaluators could not agree on the assignment of syntactic roles. Most of them present function and content word omissions (mainly lexical verbs) (Serra *et al.*, 1999).

(i) *LOG: <a ti qué te gusta hacer con la arena> [: what do you like to do with the sand?]
*JOP: <a pala> [: a shovel]> [=? With the shovel] [=? To play with the shovel].

lated on the basis of the MLU-w (1;6 years of difference vis-à-vis the children with SLI and Age Controls). This group belongs to the Serra-Solé Corpus in the CHILDES project (MacWhinney, 1995).

Demographic data of the children in the sample are shown in table 1.

TABLE 1. DEMOGRAPHIC VARIABLES OF THE CHILDREN.

<i>Children</i>	<i>Trans.</i>	<i>Age</i>	<i>Sex</i>	<i>Lang.</i>	<i>Mlu-w</i>	<i>NV-IQ</i>	<i>V-IQ</i>	<i>Hearing</i>	
01	SLI	01t-1.cha	3;11	F	Cat./Spa.	1,27	117	94	19
	Mlu-w	12-7.cha	1;6	F	Cat./Spa.	1,2	*	*	*
	Age	01c-1.cha	3;09	F	Cat./Spa.	2,76	**	**	**
06	SLI	06t-1.cha	4;01	M	Cat./Spa.	1,42	114	—	OK
	Mlu-w	07-12.cha	2;3	M	Cat./Spa.	1,4	*	*	*
	Age	06c-1.cha	4;03	M	Cat./Spa.	4,01	**	**	**
12	SLI	12t-1.cha	3;10	M	Cat./Spa.	1,47	110	—	18
	Mlu-w	05-26.cha	2,5	M	Cat./Spa.	1,51	*	*	*
	Age	12c-1.cha	4;0	M	Cat./Spa.	4,71	**	**	**
13	SLI	13t-1.cha	3;10	F	Cat./Spa.	2,01	86	53	10
	Mlu-w	09-10.cha	2;8	F	Cat./Spa.	2,0	*	*	*
	Age	13c-1.cha	3;06	F	Cat./Spa.	3,59	4 years ¹	4 years ¹	**
15	SLI	15t-1.cha	3;07	M	Cat./Spa.	2,27	120	43	13
	Mlu-w	06-14.cha	2;8	M	Cat./Spa.	2,4	*	*	*
	Age	14c-1.cha	3;09	M	Cat./Spa.	3,85	**	**	**

Trans = transcription; MLU-W= Mean Length of Utterance by words; Lang. = languages spoken by the children; NV-IQ= Nonverbal Intelligence Quotient; V-IQ= Verbal Intelligence Quotient; Hearing = mean of audition lost.

* The Serra-Solé corpus neither has data of the IQ nor of the audition of these children, but they are children that are acquiring the language in an appropriate way and they don't present signs of mental retardation neither of auditory loss.

** We didn't have the opportunity to test the wppsi and the audiometry to the children of the age control group for school questions; however, they were children with a normal acquisition in all the levels and with a good level in the formal learning.

¹ Brunet-Lezine Infant Developmental Scale

Transcription and categorization

The interviews lasted 45 minutes and were transcribed orthographically in CHAT format (MacWhinney, 1995) and phonetically in a dependent tier of this

format – %pho – starting from the IPA using the ASCII characters that UNIBET project proposes.

Following the hierarchical framework proposed by Stoel-Gammon (1991) the transcriptions were coded in several levels, although here we describe only the tiers that refer to the Syllabic level:

– CV structure produced by the children and the errors related to the CV structure of the adult target. () represents an omission, [+] an insertion and [] a change between consonants and vowels in the syllable.

– Phonological simplification processes related to syllable structure, following Ingram (1983) and Bosch (1983, 1987) (figure 1). Examples of phonological simplification processes could be seen in Annex 1.

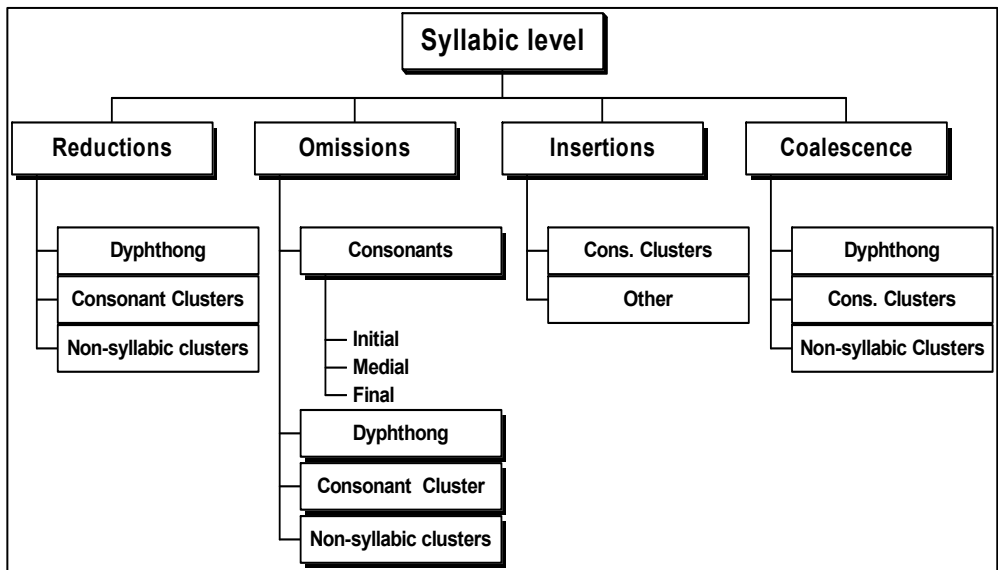


Figure 1: Summary of simplification processes.

Example of transcription and codification:

- (4) *CHI: *una estrella* (a star)
 %pho: 'wa es'teLa
 %syl: 'v(-c)v 'c(c)v-cv
 %err: 'una = 'wa \$SOCM; es'treLa = es'teLa \$SRCC \$SRGR;

Reliability

The phonetic transcription was carried out by the first author, who requested help from two judges in cases of doubt. In the event of disagreement, or if the quality of the sound made transcription impossible, the code XXX was used to denote an indiscernible production, XX an indiscernible word, and ? an indiscernible sound.

The recordings of 4 children (20% of sample) selected randomly were transcribed by the first author one year later. The agreement between the original and the new transcriptions was 93%.

The same 4 recordings were re-transcribed by a new independent judge (a trained speech therapist) and the inter-judge agreement with the first transcriptions was 92%.

Analysis

Interjections, fillers, onomatopoeias and songs were excluded from the analysis, as were the words or sounds for which no agreement was reached, as regards transcription, coding or the adult target that should be applied.

Syllabic structure was considered correct if all those syllables had the expected structure and incorrect if there were omissions or insertion of vowels and consonants. Following Stoel-Gammon (1991) the replacement of one sound by another, without any change in the syllabic structure, was not considered as incorrect.

The percentages of correct syllable structure and each type of simplification process were calculated applying the rule: Frequency of type divided by the total elements that can present the simplification (tokens) (e.g. % Cluster reduction = frequency of cluster reduction*100/ total number of clusters).

Using these data as our basis, we conducted a statistical comparison of the means with the Mann Whitney non-parametric U test, since the sample was small and, in some variables, the variances were not equal between groups.

Results

The data analysed for each group are shown in table 2, as are the data that were excluded from the analysis, either because they were unintelligible or because we had no knowledge of the adult target.

The syllables with the highest correct percentages in all the groups were CV and V, following by the structures with diphthongs (table 3).

Significant differences could be observed in virtually all syllabic structures (table 3) between the SLI and their Age controls, except those composed only by a nucleus (simple or multiple).

TABLE 2. NOT ANALYSED DATA AND ANALYSED DATA USED FOR EACH GROUP.

<i>Mean of group</i>	<i>% of Excluded Words</i>	<i>Total Analysed Material</i>	
		<i>Mean Words</i>	<i>Mean Syllables</i>
<i>SLI</i>	7.10 %	188.4	315.6
<i>C MLU-w</i>	8.28 %	589	948.4
<i>C Age</i>	3.72 %	506.2	806

The ability of SLI and MLU-w groups to use complex syllabic structures (VC, CVV, CCV, CVC, CVVC, CCVC AND CVCC) was similar, but we observed significant differences between the children of the SLI group and their MLU-w controls in the use of CV, the simplest structure in terms of acquisition.

TABLE 3. PERCENTAGE OF CORRECT SYLLABIC STRUCTURES AND STATISTIC DIFFERENCES (U MANN WHITNEY).

Syllabic Structures	<i>SLI</i> <i>X(σ)</i>	<i>Age Cont.</i> <i>X(σ)</i>	<i>MLU Cont.</i> <i>X(σ)</i>	<i>Diff.</i> <i>SLI/Age</i>	<i>Diff.</i> <i>SLI/MLU</i>
<i>v</i>	85.2 (9.4)	86.2 (11.0)	88.4 (9.3)	Non sign	Non sign
<i>vv</i>	97.2 (6.2)	100 (0)	61 (30.05)	Non sign	(.071)
<i>cv</i>	85.8 (9.09)	96.2 (2.4)	95 (1.4)	.032 **	.016**
<i>vc</i>	55.2 (23.2)	87.4 (7.5)	55.4 (25.5)	.008**	Non sign
<i>cvv</i>	47 (24.9)	87.4 (11.6)	69.2 (17.6)	.016**	Non sign
<i>ccv</i>	42.5 (24.7)	78.8 (11.6)	43.7 (17.0)	(.095)	Non sign
<i>cvc</i>	39.4 (15.5)	86.4 (8.5)	57.8 (25.9)	.008**	(.095)
<i>cvvc</i>	-	76.4 (13.6)	47.6 (18.7)	-	-
<i>ccvc</i>	-	94.0 (9.5)	54 (25.4)	-	-
<i>cvcc</i>	-	75.3 (11.8)	68 (11.3)	-	-
<i>Other</i>	8.5 (19.1)	96.5 (5.4)	34.3 (35.6)	.008**	Non sign
Total	74.8 (5.3)	91.7(3.1)	83.6 (4.4)	.008**	.056

There were no differences in the frequency of the syllabic simplification processes in any of the SLI and MLU-w groups: The two groups have a similar pattern and frequency of those simplifications (table 4). However, in comparison with the age controls, SLI presented more syllabic and non-syllabic cluster reduction and initial, medial and final consonant omissions.

So we found differences in children with SLI with respect to their Age Controls in the acquisition of syllabic structures. Differences were observed between SLI and MLU-w Controls, the most interesting being in the CV syllable structure.

TABLE 4. SIMPLIFICATION PROCESSES WITH MORE THAN 5% OF OCCURRENCES IN ANY OF THE GROUPS AND THEIR STATISTICAL DIFFERENCES (U MANN-WHITNEY).

Simplification Processes	SLI	Age Controls	MLU-w Controls	Diff.	Diff.
	<i>X</i> (σ)	<i>X</i> (σ)	<i>X</i> (σ)	SLI/Age	SLI/MLU
Diphthongs reduction	21.0(23.8)	7.3(4.4)	21.3(14.5)	Non sign	Non sign
Cons. cluster reduction	54.8 (29.6)	8.8(8.8)	48.7(29.6)	.008**	Non sign
Non-syllabic cluster red.	40.1(18.6)	10.2(4.1)	48.5(26.6)	.008**	Non sign
Initial cons. omission	8.8(6.4)	0.79(.67)	2.6(3.1)	.008**	(.095)
Medial cons. omission	7.0(4.3)	1.9(2.3)	3.8(2.0)	.032**	Non sign
Final cons. omission	46.2(23.5)	9.9(7.7)	30.1(26.5)	.016**	Non sign
Cons. cluster omission	11.9(19.3)	2.2(3.1)	4.3(6.4)	Non sign	Non sign
Cons. cluster insertion	15.0(25.9)	4.4(5.4)	2.4(3.6)	Non sign	Non sig.
Cons. cluster coalescence	1.5(3.4)	1.5(2.6)	7.08(8.6)	Non sig.	Non sign

Of the CV incorrect syllables produced by children with SLI most are weak syllables (65.1%), initial (44.1%) or final (30.4%), whose target has a segment composed mainly by a stopped (36.2), a triller (22.4%) or a nasal (20.6%). The most common error in children with SLI was the deletion of the consonant (52%). Some examples of deletion of the onset consonant are shown here in (5), (6) and (7):

- (5) *leche* /^lletʃe/ (milk) → /^leje/ ‘v-cv
 (6) *silla* /^ssiʎa/ (chair) → /^sita/ ‘v-cv
 (7) *tovalla* /^ttuβaʎə/ (towel) → /u^lβajə/ v-‘cv-cv

Discussion and conclusion

Our data show that phonological acquisition is delayed in children with SLI with regard to the scores expected for their age. This delay is evident in practically all the structures in the SLI group, except the nuclear syllable V. This delay in SLI children is also evident in the processes of simplifications: cluster and non-syllabic cluster reduction and initial, medial and final consonant omissions are significantly higher in children with SLI than in the Age controls.

On the other hand, the pattern of correct syllables and simplification processes in children with SLI and MLU-w controls is similar, but we observed one area where there is a significant quantitative difference: CV Syllable structures are less correct in children with SLI than in their language level counterparts.

As regards simplification processes, many authors (Fee, 1995; Beers, 1992; Hansson *et al.*, 1998; Orsolini, Sechi, Maronato, Bonvino, & Corcelli, 2001) have found complex syllable simplifications to be the most characteristic process in SLI children; however, we found their use to be similar to that expected for their language level when compared with their MLU-w controls.

These results could be taken to suggest that acquisition is deviant in SLI children. This is because late acquisitions (CVC, or VC, or CCV syllables) have already appeared when early acquisitions (CV syllables) are stagnant, although the order of acquisition is no different. According to Menyuk (1993) these stagnation patterns are characteristic of SLI children and indicate a deviation in their development. Other authors (Curtiss & Tallal, 1991) interpret this pattern as a delay rather than a deviation. We believe that their level of phonological acquisition is more likely to represent a deviation, rather than a delay because their level is not similar to that expected for their language level on the basis of the comparison with MLU-w controls. As we have pointed out, other authors (Rescorla & Bernstein Ratner, 1996; Roberts, Rescorla, Giroux, & Stevens, 1998) also found this pattern, since differences were found in the percentages of correct consonants between children with SLI and other groups (delays and controls). These data suggest that this pattern is characteristic of children with SLI.

On the other hand, these data do not bear out the predictions of Fee (1995) in connection with the hypothesis of missing features of grammar in SLI (Crago & Gopnik, 1994). Fee suggests that one of the characteristic simplifications of these children is found in syllabic structures: cluster reductions, consonant omissions, etc. However, our data show that the frequency of these processes is similar in SLI children and language level controls, so it does not seem a characteristic error of these children.

Fee's hypothesis also posits that the CV syllable is universal and, therefore, can be used efficiently by children with SLI, since they do not need syntactic-semantic rules to produce it, and in fact all the other syllables would be reduced to this structure. Our results show that SLI children use CV syllable structures less correctly than their Age and MLU-w controls, so this prediction was not borne out in our languages either.

In the light of these results, further investigation is needed to determine the possible causes and explanations of the misproduction in the CV syllables and the specific pattern of acquisition in children with SLI. Following the functional constraints account (Handford & Stemberger, 1998) it is possible that an interaction of different levels (such as segmental and word levels), different mechanisms (such as perceptual salience and the weighting of prominence effects) (Kehoe &

Stoel-Gammon, 1997), together with specific problems, such as a deficit in temporal processing limitation, phonological memory or in the general processing capacity (Leonard, 1998; Cooperson *et al.*, 2013) produces this specific pattern of phonological acquisition in SLI.

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ANNEX 1

EXAMPLES OF SIMPLIFICATION PROCESSES.

– Reductions:

- Clusters: tren /'tren/ (train) --> /'ten/
- Diphthongs: peine /'peIne/ (comb)--> /'pene/
- Non-syllabic clusters: menta /'menta/(mint) --> /'meta/

– Omissions:

- Consonants: pan /'pan/ (bread) --> /'pa/
- Consonant cluster: tren /'tren/ (train)--> /'en/
- Non-syllabic clusters: menta /'menta/ (mint)-->/'mea/

– Insertions:

- Consonant clusters: tren /'tren/ (train) --> /te'ren/
- Others: mar /'mar/ (see)--> /'mart/

– Coalescence:

- Consonant clusters: tren /'tren/ (train) --> /'den/
- Dyphthongs: : peine /'peIne/ (comb)--> /'pone/
- Non-syllabic clusters: menta /'menta/(mint) --> /'mela/

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